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High Rate of Respiratory MDR Gram-negative Bacteria in H1N1-ARDS treated with ECMO

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Dear Editor,

During the H1N1 viral respiratory epidemic some patients required admission to the Intensive care unit (ICU) and ECMO was sometimes used after failure of mechanical ventilation (1,2). Infectious complications of ECMO are ranked second after haemorragic complications, and are mainly represented by bloodstream infections (BSI) with Gram-positive cocci (3,4). We report the main clinical and microbiological findings of 16 patients (Table 1) with H1N1-ARDS treated with or without ECMO, according to the Italian guidelines (2,5).

All patients were treated with empiric antibiotic treatment and oseltamivir. ECMO was used for 15.14 ± 14.01days (range, 7-46) after a mean of 1.9 days of mechanical ventilation. Respiratory samples were positive during the ICU stay in seven patients: five (71.4%) in ECMO group (multi-drug resistant (MDR) *P. aeruginosa*, MDR *S. maltophilia*, *S. marcescens*, MDR *A. baumannii*, *K. pneumoniae* producing carbapenemases (KPC) and *Aspergillus fumigatus*) compared to two (22.2%) in the no-ECMO group (two *A. baumanni* isolates) (p =0.04). There was only one positive blood culture for *S. marcescens* in the ECMO group. The mortality was 28.6% and 44.4% in patients treated with or without ECMO, respectively. An infection was the probable cause of death in all patients who died. A possible fungal infection by *A. fumigatus* was responsible for one death.

Selective antibiotic pressure …… We investigated the possible role of selective antibiotic pressure as a predisposing factor for the isolation of respiratory MDR Gram-negative bacteria. The mean daily defined doses (DDDs) at 14 days were 347 Vs. 1020 (p=0.04) for meropenem and 316 Vs. 632 (p=0.012) for levofloxacin in the ECMO Vs. no-ECMO group, respectively. By converse, vancomycin and linezolid DDDs were higher in the ECMO group compared to the no-ECMO group: 138 Vs. 102 and 561 Vs. 122, respectively (not significant).

The rate of infections during ECMO varies from 7.5% to 45.5% and are more often caused by MDR bacteria isolated from the bloodstream (4,5). In our ECMO patients the isolation of respiratory MDR Gram-negative bacteria may be due to the specific setting of H1N1 syndrome probably favoured by the mechanical ventilation, the comorbidities but not by a significantly higher antibiotic consumption against Gram-negatives. In conclusion, notwithstanding the low number of H1N1 patients, we found that in ECMO patients there is a significantly higher rate of respiratory MDR Gram-negative bacteria which is not explained by an excessive selective antibiotic pressure, suggesting that H1N1 infection and ICU stay are more important as risk factors compared to the ECMO support itself.

Table 1. Demographics and clinical characteristics of patients treated without or with ECMO.

Variable	NO ECMO (n=9)	ECMO (n=7)
Age, mean (SD)	58 ± 15.6	35.5 ± 11.1
Male sex, n (%)	3 (33.3)	5 (71.4)
BMI, n (%)		
≥40	0	2 (28.6)
30-39	3 (33.3)	5 (71.4)
Comorbidities, n (%)	7 (77.8)	2 (28.6)
- Asthma	2 (22.2)	1 (14.3)
- COPD	1 (11)	0
- Cardiovascular diseases	3 (33.3)	0
- Chronic Renal Failure (CRF)	0	1 (14.3)
- Diabetes	2 (22.2)	0
- Haematologic disease	4 (44.4)	1 (14.3)
- Solid organ cancer	1 (11)	1 (14.3)
APACHE II Score, mean (SD)	21.3 ±4.5	14.8± 7
P/F on ICU admission, mean (±SD)	89 ± 42.8	73 ± 24.1
Mortality, n (%)	4 (44.4)	2 (28.6)
Duration of hospital stay (days)		
ICU	14.5 (1-44)	28.2 (9-63)
Total	19.6 (6-49)	31.57 (18-66)
ECMO support	-	15.1 (7-46)

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